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(54) X-ray examination of containers and lorries for concealed automobiles

(57) An apparatus for examination of containers (4a) or motor lorries (4) is arranged to detect concealed large objects such as automobiles. The apparatus has an examination bay (1, 2) through which a motor lorry (4) is driven under its own power, and an X-ray examination system with a low-energy X-ray source (5, 6) with corresponding detectors (7, 8) arranged to scan the container or lorry during transit through the bay.

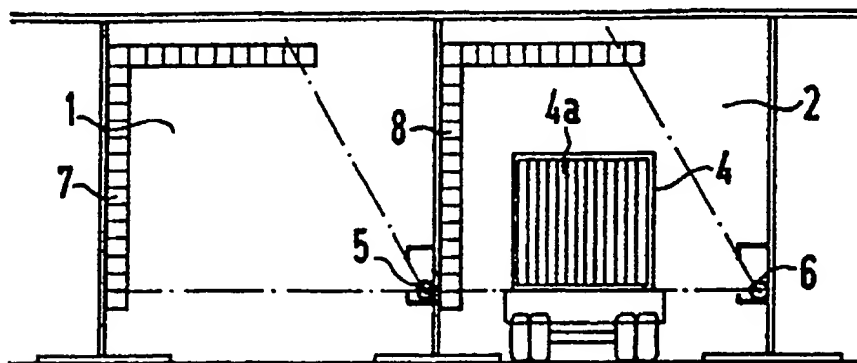


FIG 1

GB 2 277 013 A

FIG 2

- 1 -

TITLEApparatus for Examination of Containers and Vehicles

This invention relates to an apparatus for examination of containers and motor lorries with the view to detect the theft and smuggling of motor vehicles, particularly of passenger cars of the luxury class, which is becoming an increasingly serious economic factor.

Investigations by certain authorities have shown that many vehicles are smuggled out of one country packed in containers or in lorries. As the inspection of lorries and containers is very difficult and expensive only a small number of these crimes are solved.

One method for revealing such freight is the container trans-illumination system which has been available for some years. An essential aspect of such systems, however, is the necessity of obtaining an image as near optimum as possible in order to ascertain whether the load is generally in accordance with the bill of lading. Certain kinds of smuggled material can then naturally be revealed.

These installations suffer from the disadvantage of considerable costs due to the technique of obtaining high-quality images (such as by use of high energy

X-rays, for example 2-10 meV), the relatively low throughput (about 25 lorries per hour) due to safety measures such as gates and autonomous driverless transport systems and the large amount of space required by the screening operations and the infrastructure involved.

One object of this invention is to provide examination equipment for containers and motor lorries which is relatively simple and inexpensive to construct and which enables large objects, particularly concealed passenger vehicles, to be revealed.

According to this invention there is provided apparatus for examination of containers or motor lorries comprising an examination bay through which the lorry or container is moved, which bay houses a low-energy X-ray examination system comprising an X-ray source and X-ray detector.

This invention is thus based on a simple X-ray examination procedure of a kind which is known and carried out on luggage at airports for example. The cost involved is extremely moderate. The X-ray source and X-ray detector employed may generally comprise standard components or at least such components in a slightly modified form. As tests and measurements have shown, images clearly revealing the presence of passenger

cars in containers or motor lorries can be produced using comparatively low currents, (for example 1mA) and X-ray energy (140 keV).

This invention also provides a method for detecting vehicles concealed within a road vehicle or transport container, which method comprises driving the road vehicle or container through an examination bay, subjecting said road vehicle or container to a low-energy X-ray source positioned at one side of the bay, detecting said X-rays at the other side of the bay after passage through the vehicle or container, and forming an image from the detected X-ray signals.

Due to the low X-ray dose, a typical level in the interior of the container being below 1/10000 of the dose involved in thoracic radioscopy, the system can be simplified still further. The driver of the motor lorry or container vehicle does not have to leave his cabin but drives the vehicle through the screening post himself. Despite the low dose however, a further system and preferred feature of this invention prevents the driver's cabin from being exposed to radiation.

Among the main spheres of application for an examination and detection system of the kind according to this invention are frontier crossings, seaports and toll stations although mobile systems for flexible application

can likewise be considered.

In addition to the detection of stolen motor vehicles it is also possible, within certain limits, to obtain further information from the X-ray images. This depends on the radiation dosage, the quality of the detectors and on an optimised signal processing method. Their main purpose, however, will be detection of passenger vehicles.

This invention will be explained in more detail with reference to an embodiment shown as an example in the drawings and wherein:

Figure 1 is a rear view of an examination apparatus, and

Figure 2 is a plan view of the apparatus.

The drawings show two examination sections or bays 1,2, through which motor lorries 3,4 loaded with containers 3a,4a, or motor lorries with conventional body superstructures are driven. The examination bays 1,2, contain X-ray examination units with radiation devices 5, 6, and detectors 7,8, respectively, each of the latter being formed from an angular strip. The detectors 7,8, are constructed from a series of detector elements of which the output signals are converted in a known manner into an image of the relevant irradiated zone of the motor lorry 3 or 4 of container 3a or 4a.

It is a feature that the motor lorries 3, 4 are driven under their own power by the drivers themselves through the examination bays 1,2, which are open in the direction of travel, that is not closed by gates. Light beams 9,10, or comparable systems ensure that the radiation is shut off while the driver's cabin is passing through the X-ray examination system 5,7, or 6,8, in other words, the said X-ray examination system 5,7 or 6, 8, is not activated until the end wall of the driver's cabin arrives at the light barrier.

It is a feature that the motor lorries 3, 4 are driven under their own power by the drivers themselves through the examination bays 1,2, which are open in the direction of travel, that is not closed by gates. Light beams 9,10, or comparable systems ensure that the radiation is shut off while the driver's cabin is passing through the X-ray examination system 5,7, or 6,8, in other words, the said X-ray examination system 5,7 or 6, 8, is not activated until the end wall of the driver's cabin arrives at the light barrier.

driven under its own power through the apparatus.

6. Apparatus in accordance with any preceding claim, wherein the examination bay includes a light barrier which switches on the X-ray radiation system after the driver's cabin has passed said X-ray examination system.

7. Method for detecting vehicles concealed within a road vehicle or transport container, which method comprises driving the road vehicle or container through an examination bay, subjecting said road vehicle or container to a low-energy X-ray source positioned at one side of the bay, detecting said X-rays at the other side of the bay after passage through the vehicle or container, and forming an image from the detected X-ray signals.

8. Method in accordance with Claim 7, wherein said image is formed continuously and synchronised with the vehicle movement, or step-wise in sections as the vehicle moves predetermined distances.

9. Apparatus for examination of containers or lorries constructed and arranged to function as described herein and exemplified with reference to the drawings.

10. Method for detecting vehicles concealed in a container or lorry carried out substantially as described herein and exemplified.

Patents Act 1977**Examiner's report to the Comptroller under Section 17
(The Search report)**Application number
GB 9406589.3**Relevant Technical Fields**

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Search Examiner
H J EDWARDSDate of completion of Search
8 JUNE 1994**Databases (see below)**

(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii) ONLINE DATABASES: WPI

Documents considered relevant
following a search in respect of
Claims :-
1 TO 10**Categories of documents**

- X:** Document indicating lack of novelty or of inventive step. **P:** Document published on or after the declared priority date but before the filing date of the present application.
- Y:** Document indicating lack of inventive step if combined with one or more other documents of the same category. **E:** Patent document published on or after, but with priority date earlier than, the filing date of the present application.
- A:** Document indicating technological background and/or state of the art. **&:** Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
X	GB 2110037 A	(CABLE) whole document	1,2,7,8
P X	WO 93/14419	(CAMBRIDGE) 22 July 1993 whole document	1,2,5,7,8
P X	US 5237598	(ALBERT) 17 August 1993	1, 7
X	US 4599740	(CABLE)	1,2,3,7,8

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